EXAMINATIONS COUNCIL OF ESWATINI
Junior Certificate Examination

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

ADDITIONAL MATHEMATICS **519**

October/November 2024

2 hours 30 minutes

Candidates answer on the Question Paper.
Additional materials: Geometric instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces provided.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use an HB pencil for any diagrams or graphs or rough working.
Do not use staples, paperclips, highlighters, and glue or correction fluid.

Answer **all** questions.

All working should be clearly shown below that question.
The number of marks is given in brackets [ ] at the end of each question or part question.

Scientific calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures.
Give answers in degrees to one decimal place.
For π, use 3.14 or the value given in the specific question.
The total marks for this paper is 100.

For Examiner's Use	
1	
2	
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Total	

This document consists of **15** printed pages and **1** blank page.

1 **(a)** You are given

$$A = \begin{pmatrix} -4 \\ 5 \end{pmatrix} \qquad B = \begin{pmatrix} -4 & 5 \\ 2 & -3 \end{pmatrix} \qquad C = \begin{pmatrix} 6 & -2 \\ 1 & -8 \end{pmatrix} \qquad D = \begin{pmatrix} -1 & 2 & -4 \\ 0 & 1 & 3 \end{pmatrix}$$

(i) Work out.

(a) B – C

Answer (a)(i)*(a)* ..... [2]

(b) 3D

Answer (a)(i)*(b)* ..... [2]

(c) BA

Answer (a)(i)*(c)* ..... [2]

(d) B^2

Answer (a)(i)*(d)* [3]

(ii) Find matrix E such that $C + E = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$.

Answer (a)(ii) *E* = [2]

(b) $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 2 & 4 \\ 6 & -5 \end{pmatrix}$

Write down the values of *a, b, c* and *d*.

Answer (b) a = ...

b = ...

c = ...

d = ... [1]

(c) $\begin{pmatrix} x & 1 & 4 \end{pmatrix}\begin{pmatrix} 3 & y \\ -1 & 2 \\ 7 & 2 \end{pmatrix} = \begin{pmatrix} 36 & 25 \end{pmatrix}$

Find the values of *x* and *y*.

Answer (c) x = ...

y = ... [3]

(d) Write down the order of this matrix $\begin{pmatrix} -2 & 1 \end{pmatrix}$.

Answer (d) ..... [1]

2 **(a)** $f(x) = 2x - 1$ and $g(x) = 2 - 3x$.

(i) Find f(2).

Answer (a)(i) ..... [1]

(ii) If f(x) = g(x), find the value of x.

Answer (b)(ii) x = ... [2]

(iii) Find the maximum integer value of x if g$(x) > 10$.

Answer (b) x = ... [3]

(b) For a particular function, the domain and range are as follows:

Domain	**Range**
2	5
3	6
4	7
5	8
6	r
m	y

(i) Find the value of r.

Answer (b) (i) r = ……..…….....….....[1]

(ii) Express y in terms of m.

Answer (d) (ii) y = …….....[2]

3 Siphelele has 8 socks in a drawer.

5 of the socks are black.

3 of the socks are white.

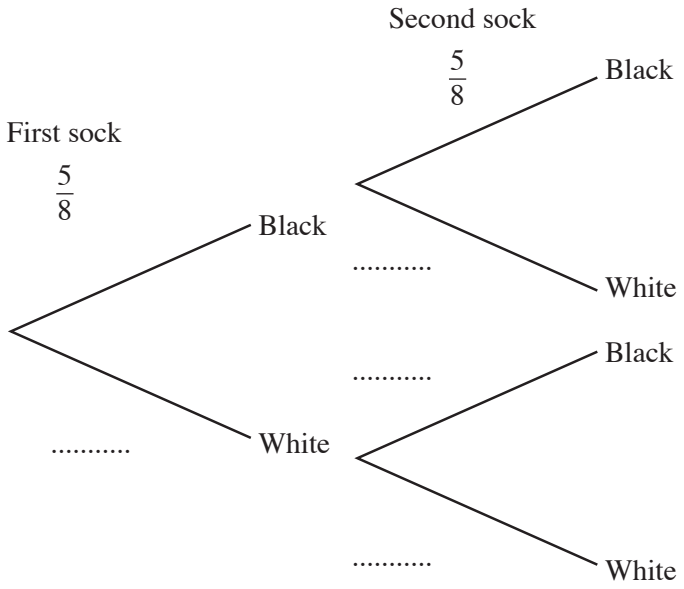
(a) Find the probability of choosing a white sock from Siphelele`s drawer.

Answer (a) …….....….....[1]

Siphelele takes out a sock at random, writes down its colour and puts it back into the drawer.

Then Siphelele takes out a second sock, at random, and writes down its colour.

(b) **(i)** Complete the probability tree diagram.



[3]

(ii) Work out the probability that the two socks are of same colour.

Answer (b)(ii) …….....…….....[2]

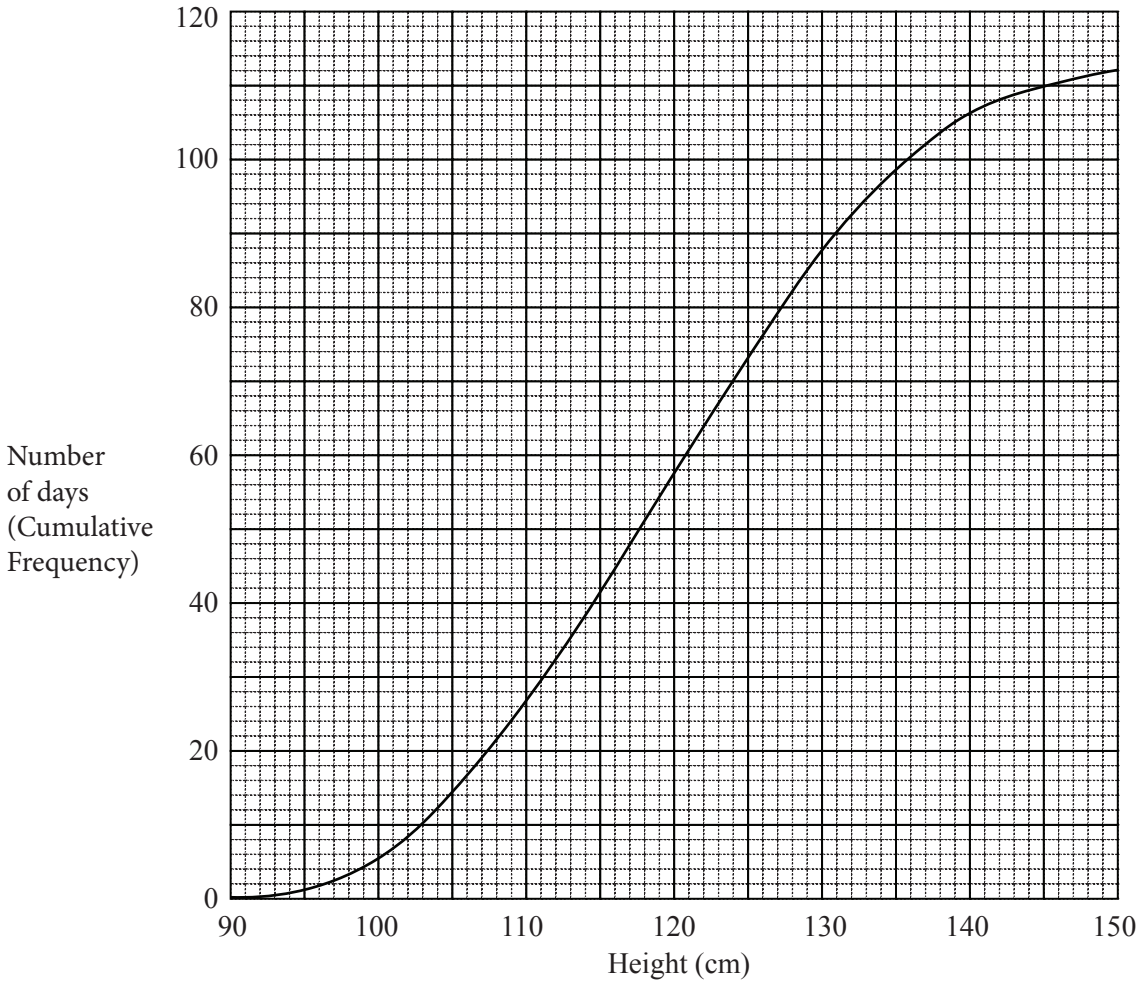
(iii) Work out the probability that the two socks are of different colours.

Answer (b)(iii) …….....…….....[2]

4 A tree was planted when its height was 90 cm.

The height of the tree was then measured over a period of 112 days.

The cumulative frequency curve below shows the height of the tree over the 112 days.



(a) Complete the cumulative frequency table

Height (cm)	Number of days (frequency)	Cumulative Frequency
90	0	0
100		5
110	22	
120	30	57
130	31	88
140		106
150	6	112

[3]

(b) Find the number of days it took for the tree to reach a height of 115 cm.

Answer *(b)* …….. [2]

(c) Find the height of the tree after 90 days.

Answer *(c)* ……...……cm [2]

5 **(a)** Simplify.

(i) $3(2a - b) - b$

Answer (a)(i) ……..……. [2]

(ii) $\frac{3}{x-5} - \frac{7}{2x}$

Answer (a)(ii) ……..……..……. [3]

(b) **(i)** Factorise.

$x^2 - 8xy$

Answer (b)(i) ……..……. [1]

(ii) Given that $x^2 + 13x - 48 = (x + a)(x - b)$, find the values of a and b.

Answer *(b)*(ii) a = …….....

b = ...……..... [2]

(c) Solve.

(i) $2(x+5) = 3(2x - 7)$

Answer (c)(i)x = ……..…….....…..... [3]

(ii) $\frac{3y - 7}{5} = 4$

Answer (c)(ii) .....[2]

(iii) $1 - 7x > 2x + 3$

Answer (c)(iii) = …….....…….....…..... [2]

(iv) $x^2 - 64 = 0$

Answer (c)(iv) x = ……..... or x = …….....[2]

(d) Make t the subject of the formula.

$G = \frac{15a}{14 - t}$

Answer (d) t =…….....…….. [3]

(e) Solve the simultaneous equations.

$4x + 2y = 5$

$3x - 6y = 6$

Answer (e) $x =$ ……

$y =$ …… [3]

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6 The table shows values of x and y connected by the equation $y = 15 - x^2 + 2x$.

x	– 4	– 3	– 2	– 1	0	1	2	3	4	5	6
$y = 15 - x^2 + 2x$	p	0	7	12	15	q	15	12	7	0	r

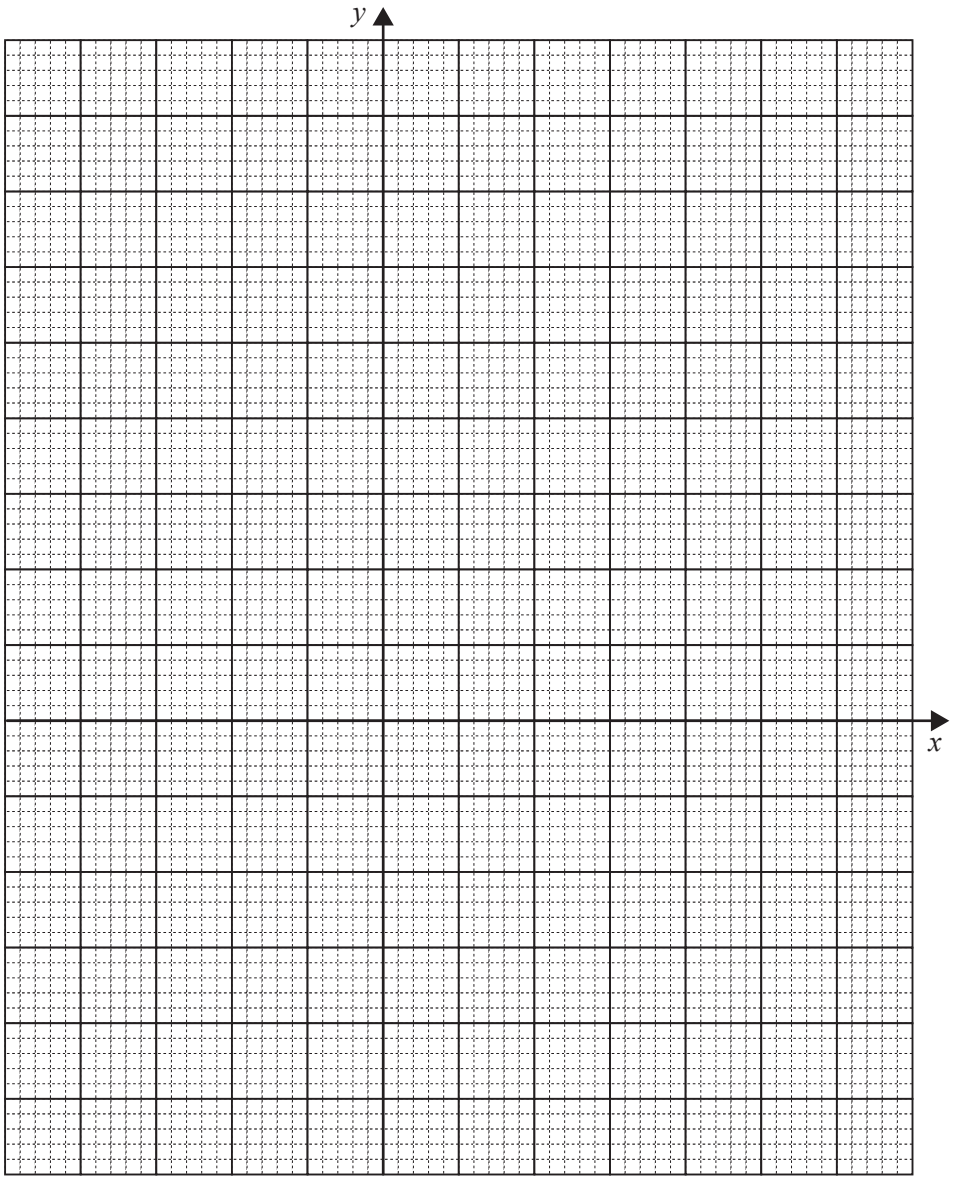
(a) Work out the values of p, q and r.

Answer (a) $p =$ ……

$q =$ ……

$r =$ …… [2]

(b) Using the set of axes below, draw the graph of $y = 15 - x^2 + 2x$.



[3]

(c) Use your graph to solve the following equations:

(i) $15 - x^2 + 2x = 5$

Answer (c)(i) x = ……..… or x = ……..…..[2]

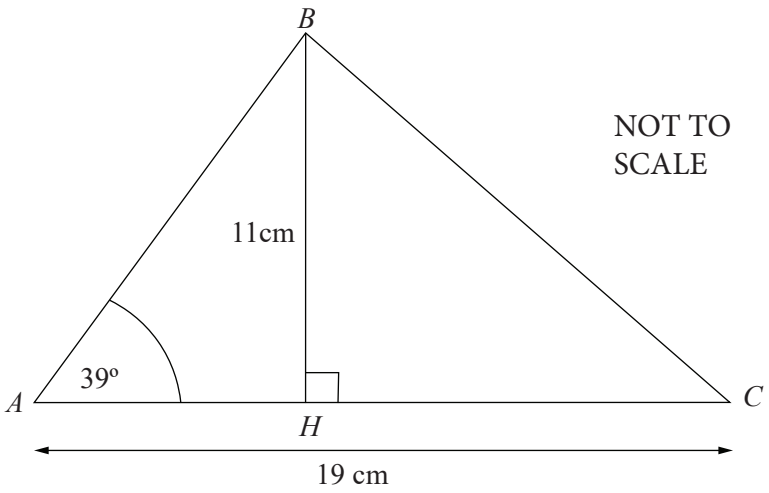
(ii) $15 - x^2 + 2x = x + 3$

Answer (c)(ii) x = ……..… or x = ……..…..[3]

(d) Expand and simplify.
$(x+6)(x-4)$

Answer (d) ……..……..… [2]

7 **(a)** In triangle ABC, BH is perpendicular to AC.
$AC = 19$ cm, $BH = 11$ cm, angle $BAH = 39^o$.



(i) Find the length of AH.

Answer (a)(i) .....cm [2]

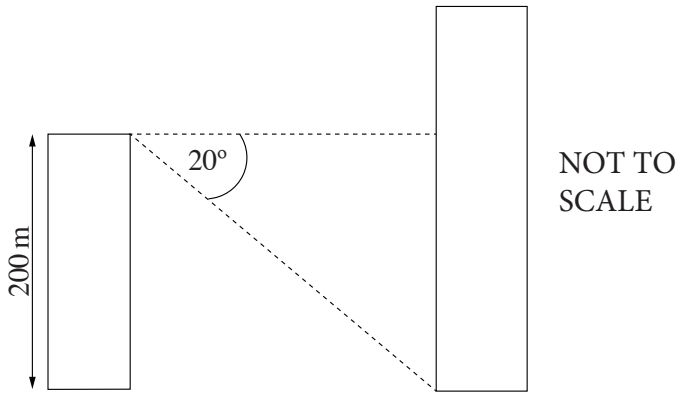
(ii) Calculate the length of BC.

Answer (a)(ii) .....cm [3]

(iii) Calculate angle BCH.

Answer (a)(iii) .....° [2]

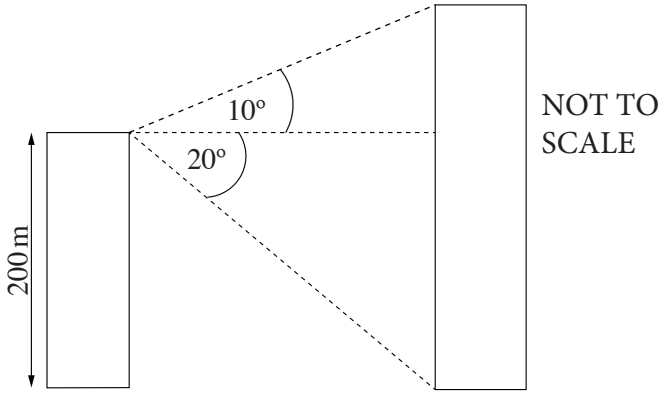
(b) From the top of a 200 metres high building, the angle of depression to the bottom of a second building is 20°.



(i) Find the distance between the two buildings.

Answer (b)(i) .....m [2]

From the same point, the angle of elevation to the top of the second building is 10°.



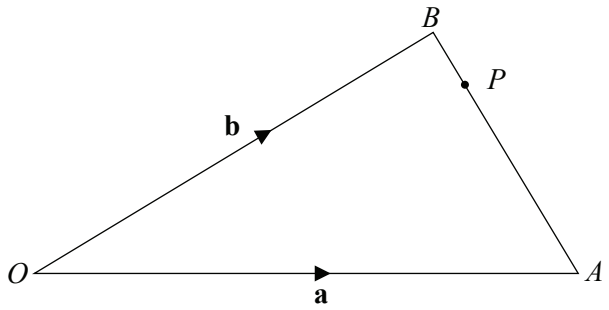
(ii) Calculate the height of the second building.

Answer (b)(ii) .....m [3]

8 **(a)** OAB is a triangle.

$\overrightarrow{OA} = \mathbf{a}$

$\overrightarrow{OB} = \mathbf{b}$



(i) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

Answer (a)(i) .....m [1]

P is a point on AB such that $AP : PB = 3:1$.

(ii) Find OP in terms of **a** and **b**.

Give your answer in its simplest form.

Answer (a)(ii) ..... [3]

(b) Given that $\mathbf{p} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$, find $|2\mathrm{p} - \mathrm{q}|$.

Answer (b) ..... [3]

(c) $\mathbf{u} = \begin{pmatrix} 2 \\ 8 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} -1 \\ -4 \end{pmatrix}$, show that **u** is parallel to **v**.

Answer (c) ..... [2]

9 Musa has 3 tennis balls in his bag. Two of the balls are green and one is red.
Nhlanhla has 5 tennis balls in his bag. Three of the balls are red and two are green.
Each of them picks a ball from their bag at random.

(a) Draw a possibility space diagram to show all the possible outcomes.

[2]

(b) Find the probability that at least one of the balls is red.

Answer (b) ..... [2]

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